

BREEDING HABITS OF THE NILGIRI LAUGHING THRUSH *GARRULAX CACHINNANS* (JERDON)¹

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(With six text-figures)

Key words: Nilgiri hills, *Garrulax cachinnans*, breeding season, nest destruction, repeat nest, incubation, brooding, nest sanitation.

The breeding habits of the Nilgiri laughing Thrush were studied in southern India between 1982 and 1984. Of the 62 nests studied 56 were built in indigenous and the remaining in exotic plants. Twenty four nests were built at 1-2 metres above ground. The birds destroy the nests after the nestlings leave the nest or if the eggs or nestlings are preyed upon. The clutch of two was laid between January and April. Both sexes incubate. Incubation period was 16-17 days and average nestlings weight 4 g. at hatching. Both parents swallow the faecal sacs. The average nestling period was 16.5 days. The breeding success for 1983 and 1984 was 64% and 56% respectively.

INTRODUCTION

There is no detailed study on the breeding biology of the Nilgiri Laughing Thrush. Brief description of different aspects of the breeding biology is available in Betham (1902), Baker (1932), and Ali and Ripley (1972). The present study describes the breeding biology in detail, based on field work in the Nilgiri hills (11°40' N and 76°14' E to 77° E) of southern India. The Nilgiris have an area of about 2525 sq. km and consist of a group of hills ranging in height between 900 and 2635 metres above mean sea level. The natural vegetation consists of extensive grasslands covering rolling hills interspersed with numerous isolated, compact, and usually small woodlands are termed 'sholas' meaning tropical rain forest. Other than sholas the area has degraded types of Southern Montane Wet Temperate Forests which Champion and Seth (1968) termed as Evergreen scrub.

MATERIAL AND METHODS

The study areas (Governor's Shola and Parson's Valley) were visited almost every day during the breeding season. Nests were located by observing the birds carrying nest material or food for the nestlings. Sometimes calls given by the bird at the nest helped in locating the nest. During the nesting period, *G. cachinnans* gave alarm calls at my approach which also provided a clue to the nesting site. When the nest was located the following data were recorded: nesting plant, height of the nest from the ground, and nesting stage. When the eggs were found, they were numbered and dated with Indian ink, weighed with Pesola spring balance and measured with vernier callipers. The growth of the nestlings was recorded whenever possible. Observations at nests were made from a hide placed six to ten metres from the nest.

RESULTS AND DISCUSSION

Breeding season: During the period from December 1982 to April 1983 and December 1983 to August 1984, a total of 62 nests were

¹Accepted September 1992.

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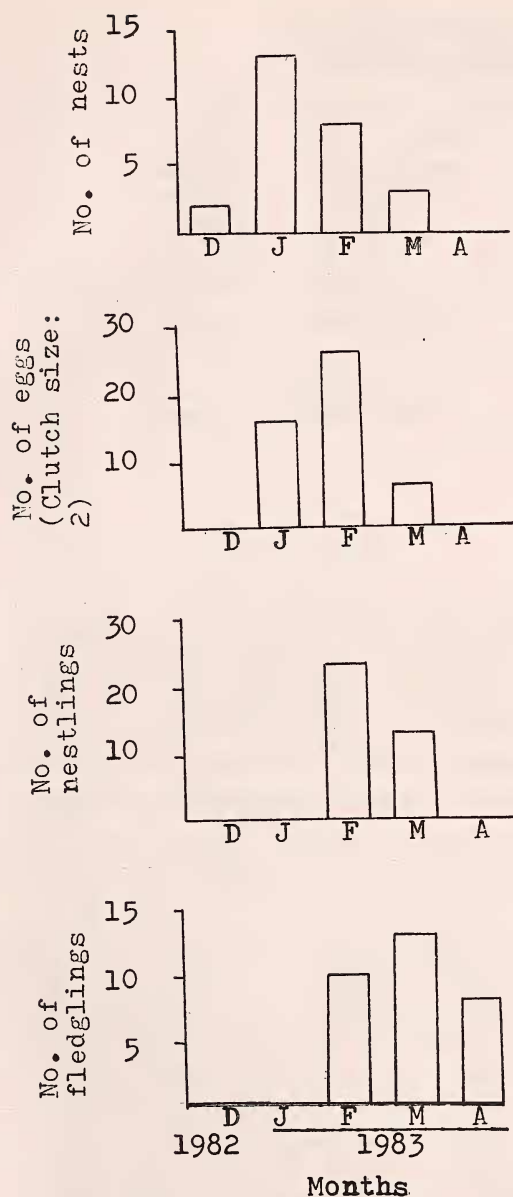


Fig. 1. Monthly distribution of nests, eggs, nestlings and fledglings of *G. cachinnans* during the 1983 breeding season.

studied at Governor's Shola and Parson's Valley. Hereafter, these periods will be referred to as the 1983 and 1984 breeding seasons.

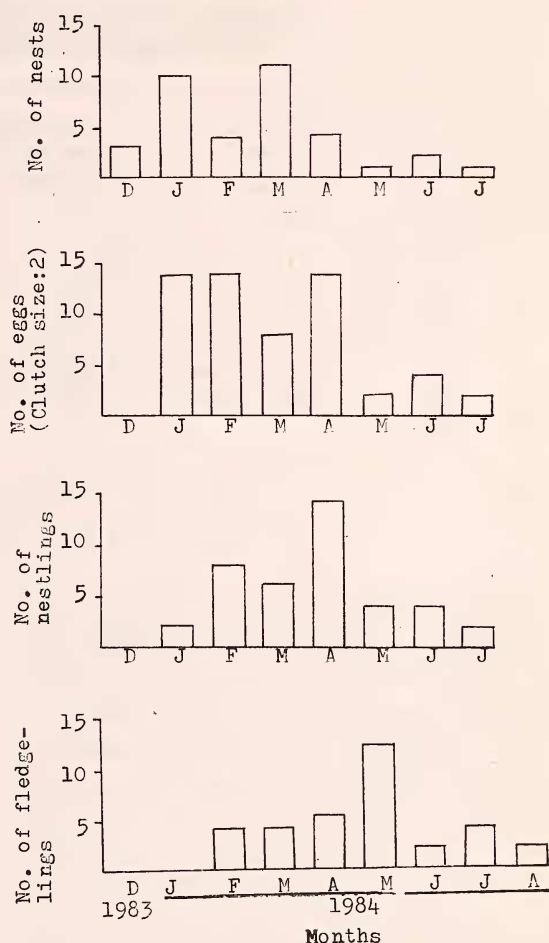


Fig. 2. Monthly distribution of nests, eggs, nestlings and fledglings of *G. cachinnans* during the 1984 breeding season.

Most of the clutches were laid between January and April (Figs. 1 and 2). Egg-laying occurred in 15 and 20 nests in January and February respectively. However, in March and April, eggs were laid in 14 nests and in May, July egg-laying occurred only in five nests. Nest ceased at the onset of the south-west monsoon (June to September).

Of the 62 nests observed in the two seasons, nine were destroyed by the birds

TABLE 1
HATCHING AND FLEDGING RECORDS OF *G. Cachinnans*
DURING THE 1983 AND 1984 BREEDING SEASONS

Date of first nest building and no. of nests found		Date of first and last egg laying		No. of eggs and no. of nestlings		No. of nestlings fledged		Last nestling left the nest
1983	1984	1983	1984	1983	1984	1983	1984	1984
16 Dec. (1982)	20 Dec. 1983	First: 9 Jan.	First: 4 Jan.	Eggs: 48	Eggs: 58	n = 31 (64%)	n = 33 (56%)	c. 18 August
Nests: n = 26 n = 36		Last: 16 July		Nestlings: n = 36 n = 40 (75%) (68%)				

themselves before egg laying. The breeding activities of *G. cachinnans* in the 1984 breeding season, from nest building (20 December) to last fledging (c. 18 August), lasted 34 weeks (Table 1). If the breeding season is calculated following Moreau (1964) and Lack (quoted by Perrins 1965) on the basis of first and last egg laying dates, then it is 27 weeks. Ali and Ripley (1972) put the breeding season of *G. cachinnans* as overall February to July, chiefly May and June. Carter and Davison (quoted by Baker 1932) gave the nesting season as February to May inclusive. Bates (quoted by Baker 1932) obtained two fresh eggs on 20 July.

Copulation: *G. cachinnans* was seen by me only in pairs, though Ali and Ripley (1972) noticed them in groups of a dozen or more. Only once a pair was seen to copulate, on a perch when the male was balancing on the female's back by constantly fluttering his wings. Time taken in mounting and dismounting was about six seconds. The pair started

building their nest on 8 February, copulated (I have seen them copulating once, they might have copulated other times) on 21 February and laid the first egg on 26 February, 1984.

Nest site: Fifty three nests were found in sholas with thick undergrowth, preferably near streams or marshes. Nine nests were found in *Acacia* and *Eucalyptus* plantations mixed with shola species. All pairs (no. of nests = 48) nested within their territories; the birds have a tendency to build the nest on the edges of sholas close to roads and cattle trails. At least seven pairs built nests between two and seven metres from their roosting trees, while two pairs used the same nest tree in subsequent breeding seasons.

Of the 62 nests, 56 were built in indigenous and the remaining in exotic plants (Table 2). Though *Sarcococca* was the most abundant undergrowth, the favourite site was *Bambusa* spp. with 11 nests, c. 18% of the total. Twenty four nests (c. 39%) were built at 1-2 metres above ground mostly placed

TABLE 2
PLANTS USED FOR BUILDING NESTS BY *G. cachinnans*
(TOTAL NESTS = 62)

	Plants	Family	Frequency
1.	<i>Bambusa</i> spp.	GRAMINEAE	11
2.	<i>Sarcococca trinervia</i>	BUXACEAE	6
3.	<i>Syzygium montanum</i>	MYRTACEAE	5
4.	<i>Viburnum erubescens</i>	CAPRIFOLIACEAE	4
5.	<i>Ilex denticulata</i>	AQUIFOLIACEAE	4
6.	<i>Syzygium calophyllifolium</i>	MYRTACEAE	3
7.	<i>Piper</i> sp.	PIPERACEAE	3
8.	<i>Eurya japonica</i>	TERNSTROEMACEAE	3
9.	<i>Mahonia nepaulensis</i>	BERBERIDACEAE	2
10.	<i>Rhododendron</i> sp.	ERICACEAE	2
11.	<i>Lonicera</i> sp.	CAPRIFOLIACEAE	2
*12.	<i>Acacia dealbata</i>	LEGUMINOSAE	2
*13.	<i>Ulex europaeus</i>	PAPILLIONACEAE	2
14.	<i>Microtropis ovalifolia</i>	CELASTRACEAE	1
15.	<i>Meliosma wightii</i>	SABIACEAE	1
16.	<i>Tylophora</i> sp.	ASCLEPIADACEAE	1
17.	<i>Cinnamomum</i> sp.	LAURACEAE	1
18.	<i>Symplocos</i> sp.	SYMPLOCACEAE	1
19.	<i>Asplenium</i> sp.	POLYPODIACEAE	1
20.	<i>Rubus ellipticus</i>	ROSACEAE	1
21.	<i>Toddalia asiatica</i>	RUTACEAE	1
22.	<i>Evodia lunurankenda</i>	RUTACEAE	1
23.	<i>Rhodomyrtus</i> sp.	MYRTACEAE	1
24.	<i>Oldenlandia</i> sp.	RUBIACEAE	1
*25.	<i>Eucalyptus globulus</i>	MYRTACEAE	1
*26.	<i>Eupatorium glandulosum</i>	COMPOSITAE	1

*Exotic species.

in a fork on the peripheral branches (Table 3). When built in more exposed places more care seemed to have been taken in selecting leafy sites, as also observed by Betham (1902). Pairs which have their first nest destroyed tend to change the height of their nest site when they rebuild, possibly to decrease the chance of predation, as also reported by Lack and Lack (1958) and Gaston (1973) for the long-tailed tit *Aegithalos caudatus*. In the 1984 breeding season, at Parson's Valley, a pair built nine nests to rear a single successful brood and every time the

species of nest plant and height were different (Table 4).

Nest building: Prior to nest building, the male and female frequently visited the nest sites, where they spent more time, feeding, preening, giving contact calls and it appears that the site selection is a joint effort. The time spent for searching of nest site varied from one day to a week. Four pairs started building repeat nests within 24 hours of abandoning the previous nest.

Both sexes share in building the nest. At the beginning the birds build the base in a

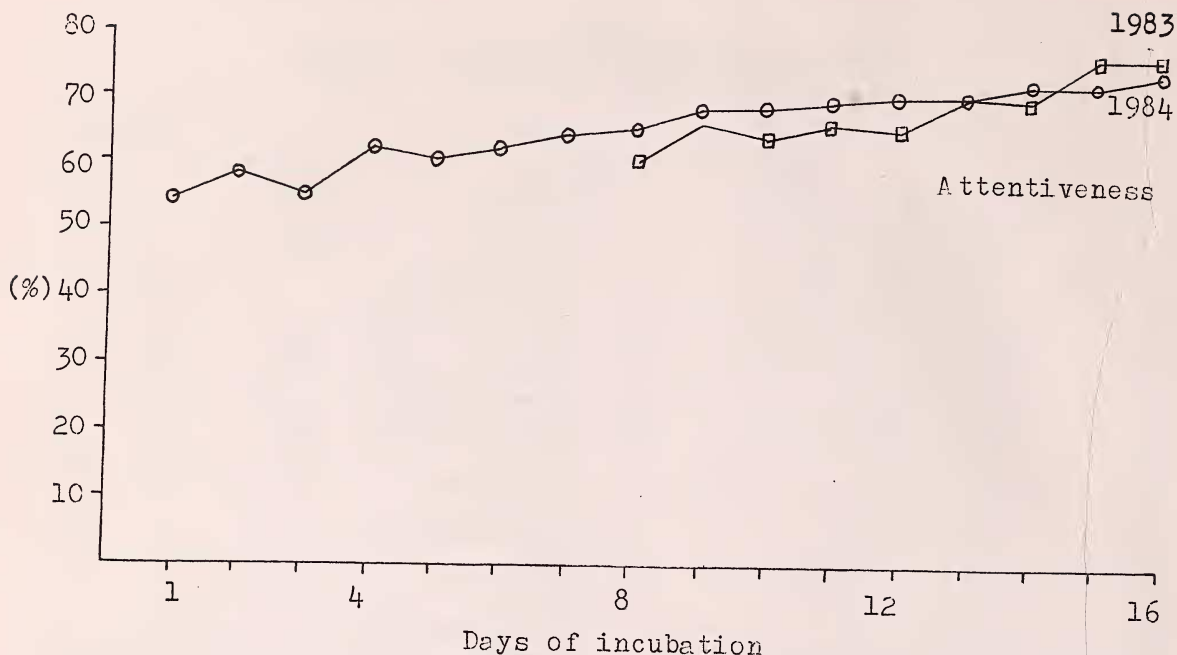


Fig. 3. Rate of incubation at two *G. cachinnans* nests in 1983 and 1984 breeding seasons.

TABLE 3
HEIGHT AND POSITION OF *G. cachinnans* NESTS

	n
Height above ground:	
0 – 1 m	16
1 – 2 m	24
2 – 3 m	12
3 – 4 m	3
4 m	7
	62
Position in plant:	43 (69%)
On the periphery	19 (31%)
In the centre	

fork, giving a general cup-shape to the nest with mosses, which are also used for attaching the nest rim to the branches. Then miscellaneous material such as dead leaves, wood, wool, paper, rootlets, cloth and thread are

placed across the bottom and the side. Fine grasses, tendrils and hair are used for inner lining, above which feathers are added. The birds finally shape the nest by crouching and rotating their body in it.

Nest building activities were observed between 0700 and 1800 hrs. I observed the rate of transportation of nest materials by two pairs of laughing thrushes for 58 hours in Governor's Shola and Parson's Valley. Results (Table 5) show the preference for nest building was in the forenoon at Governor's Shola which is statistically significant $X^2 = 24.83$, d.f. 5, $p \leq 0.05$).

The duration of nest building observed for 24 nests was five to eighteen days (Table 6). The interval between completion of the nest and laying was one to five days. Birds completed nests faster as the days progressed. This was observed by Van Tyne and Berger

(1959) also in American goldfinch. In this bird, some built nests an average in 13 days during the first two weeks of July, whereas those building during the last two weeks of August required 5.6 days. Table 6 shows that the transportation of nest material was quicker in March than in January.

Mosses, available throughout the year, comprised c. 50% of total weight (n=11) of the nest. Several other birds such as blackbird *Turdus merula* and Nilgiri verditer and grey flycatchers (Ali and Ripley 1983), tickelle's blue flycatcher (Khan 1977) and white-eye also use mosses in the Nilgiris, perhaps to camouflage the nest. Four species of mosses namely, *Papillaria* sp., *P. fuscescens*, *Meteoriopsis formosana*, *Aerobryidium filamentosum* and three leafy liverworts, *Radula* sp., *Chiloscyphus* sp., and *Lejeunea* sp., were identified from 11 nests of *G. cachinnans*.

The composition of nests depends partly on the availability of the nest material (Table 7) and head hair, fur, twine, cotton and domestic fowl feathers. The average dry weight of 11 nests was 44 g (range 30-65 g). Meas-

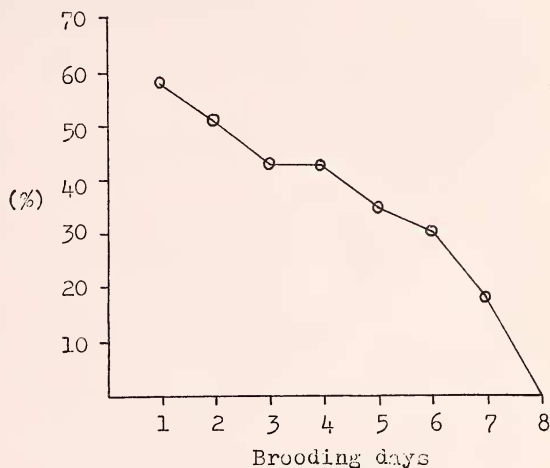


Fig. 4. Time spent in brooding at a *G. cachinnans* nest.

urements of diameter and depth of the 11 nests averaged 75 mm (range 67-87 mm) and 45 mm (range 33 - 52 mm) respectively.

G. cachinnans destroys the nest after the nestlings leave or if the eggs or nestlings are preyed upon. Sometimes they destroy the nest even before laying eggs. First nests were destroyed on predation of their contents and

TABLE 4
PLANTS, HEIGHT AND POSITION OF FIRST AND REPEAT NESTS OF A PAIR
OF *G. cachinnans* AT PARSON'S VALLEY IN 1984 BREEDING SEASON

Nests	Date	Plants	Height (m)	Position
1st nest	31.12.83	<i>Rhododendron</i> sp.	2	Centre
1st repeat	5.1.84	<i>Eurya japonica</i>	3	Periphery
Later repeats	8.1.84	<i>Acacia dealbata</i>	1.5	Periphery
	31.1.84	<i>Asplenium</i> sp.	0.5	Centre
	25.2.84	<i>Rubus ellipticus</i>	1	Periphery
	13.3.84	<i>Acacia dealbata</i>	2.5	Periphery
	30.3.84	<i>Eurya japonica</i>	2	Periphery
	6.4.84	<i>Rhodomyrtus</i>	3	Periphery
	10.4.84	<i>Oldenlandia</i> sp.	1	Periphery

TABLE 5
RATE OF MATERIAL TRANSPORTATION BY TWO PAIRS OF
G. cachinnans AT GOVERNOR'S SHOLA AND PARSON'S VALLEY

	Hours of day 0700-1800)													Total visits
	Period of Obs.	7	8	9	10	11	12	13	14	15	16	17	18	
Nest at:	No. of visits													
Govt. Shola (1-3 March, 1983)	33h	13	25	37	48	39	24	26	15	20	15	44	12	318
<i>P. Valley</i> (8-11 Jan. 1984)	25h	9	17	22	21	9	2	11	18	11	21			141

TABLE 6
TIME SPENT IN DAYS IN NEST BUILDING BY *G. cachinnans* (TOTAL NESTS = 24)

	No. of nests	Mean (days)	s.d.	Range
1st nests:				
Early season (Jan. & Feb.)	11	14	2.84	10-18
Late season (March & April)	8	7	1.75	5-11
Repeat nests:				
Early season (Jan. & Feb.)	3	14	2	12-16
Late season (March & Apr.)	2	6	6	5-8

before renesting, except in one instance when the birds destroyed the first one after the repeat nest had been built. Nest destruction is effected within 48 hours of abandoning the nest. Two pairs of *G. cachinnans* built a small platform with moss, c. 40 cm close to the original nest, which remained incomplete and was destroyed by the birds along with the original one, after the nestlings had fledged. In no case was material from the

old nest transported to the repeat nest, as has been reported for jungle babbler *Turdoides striatus* by Andrews and Naik (1970). Both the birds take part in picking and throwing the nest material around and destroy the nest in three to eight visits over one to four days.

Eggs, egg-laying and incubation: Observation showed that eggs were laid between 0600 and 0800 hrs on successive days. They were pale blue, with reddish brown speckless

TABLE 7
COMPOSITION OF TWO *G. cachinnans* NESTS

Nests No.	Type of material	Weight (g)	Total Weight (g)
1 (near human habitation)	Moss	18.0	39
	Leaves	4.0	
	Twigs	4.0	
	Cellophane paper, paper, plastic, cellophane, string, cloth, rope, thread, cotton	4.0	
	Feather and Fur	1.5	
	Hair	0.2	
	Miscellaneous	7.0	
2 (away from habitation)	Moss	17.0	38
	Leaves	7.5	
	Twigs and grass blades	4.5	
	Feather	0.7	
	Miscellaneous	8.0	

Two nests of approximately the same weight were selected to show the relative variation (by weight) of nest materials in nests and away from habitation.

TABLE 8
MEASUREMENTS OF *G. cachinnans* EGGS (n=13)

Mean length (mm)	s.d.	Mean breadth (mm)	s.d.	Range (mm)
25.2	0.53	19.1	0.29	(23.8-27.1)x (18.6-19.6)

mostly concentrated at the larger end. The average dimensions of 13 eggs were 25.2 x 19.1 mm (Table 8). The clutch size was invariably two; no clutch of three eggs was observed as reported by Baker (1932). The average fresh weight was 4.9 g (n = 13, s.d. 0.22, range 4.5-5.2 g).

Both the sexes start incubating as soon as the clutch is complete, although one of the pair was found on the nest on the first

day of laying. Van Tyne and Berger (1959) suggested that some species may sit on the eggs without incubating them. There was no incubation at night till the clutch was completed.

The incubation period was 16 days for 13 nests and 17 days for two nests. During the process of incubation two eggs of a clutch lost 0.8 g of weight. The fresh eggs weighed 5 g, on sixteenth day both were 4.2 g and

upon hatching on seventeenth day the nestlings weighed 3.8 and 3.5 g.

The periods of attentiveness (periods on the nest) and inattentiveness (periods off the nest) were observed from 0600 to 1800 hrs except for a lunch break for the observer taken at different times on successive days. When one of the pair relieved its mate from nest and continued incubation, it was noted as one uninterrupted attentive session. Data were collected from two nests for 95 and 161 hours over nine and sixteen days of incubation in 1983 and 1984 breeding seasons respectively. There was no significant variation in the rate of incubation in the last nine days at both the nests ($t = 0.81$, d.f. 16, $p \leq 0.05$). The birds on an average spent 68% and c. 70% of the total time on nest in the last nine days. The rate of incubation increased as the days progressed and reached the maximum during 2-3 days prior to hatching (Fig. 3). The average number of attentive sessions per day in 1983 and 1984 breeding seasons was 21 (range 15-27) and 20 (range 13-28) respectively.

On completing a session of incubation, one of the pair usually remained near the nest and was more attentive, raised an alarm at the approach of any intruder when the incubating bird joined in. The incubating bird otherwise did not leave the nest till the disturbance was very close. In two cases I touched the tail of the incubating birds before they left hastily. Other birds, going very close to the nest were chased away either by the incubating bird or its mate.

While on the nest the bird changed its position and turned the eggs with the bill. I heard incubating bird sometimes calling ($n=6$) from the nest, and also responding ($n=32$) to its mate's call. Gaston (1978)

reported similar behaviour for common babbler *Turdoides caudatus*.

Weather had a direct effect on incubation behaviour. The birds did not leave the nest if it rained till shower was over. In the evening heavy mist, cloud and rain sometimes stimulated the birds to settle on the nest before the normal retiring time. This behaviour was also observed by Khan (1977) in the black-and-orange flycatcher in the Nilgiris.

Hatching: The eggs hatched in the sequence of laying over a total period of six hours ($n=6$), between 0800 and 1600 hrs. Before hatching cracks appeared on the broader end, above the center, eventually forming a hole. The parents were not seen assisting the hatching chick in coming out of the shell. Once at 1030 hrs I checked a nest in which the first egg had hatched. I found a hole at the broader end of the other egg and heard the piping of the chick. I checked the nest in the afternoon and found the condition of the egg unchanged. The parents were feeding and brooding the first chick. Next day the chick died in the egg shell.

Egg shells are disposed of a distance of 20-30 m from the nest within about 45 minutes following each hatching. The parents did not remove the infertile (unhatched) egg ($n=1$) which remained in the nest even after the other nestling left. This behaviour has also been observed in the redwhiskered bulbul *Pycnonotus jocosus* (pers. obs.) and black-and-orange flycatcher (Khan 1977) in the Nilgiris. In one instance the unhatched egg remained in the nest for three days. I then broke the egg and left it in the nest whereupon it was removed by the parents.

Nestlings: The young *G. cachinnans* have down at hatching on the dorsal surface of the body, forehead, nape and the dorsal

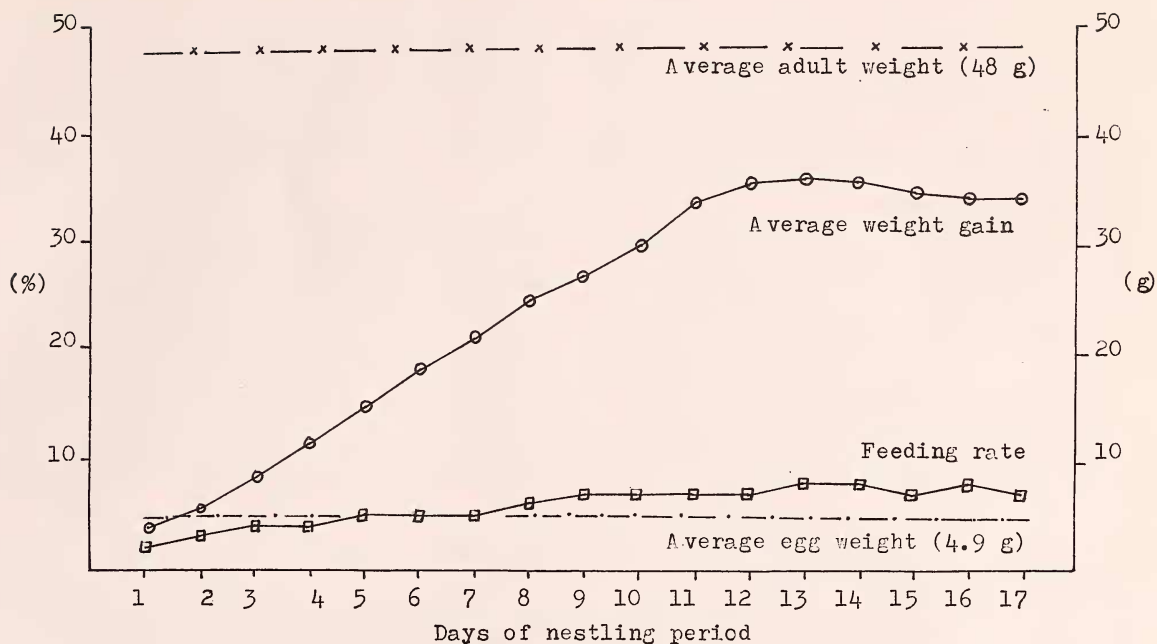


Fig.5. Rate of feeding visits by the parents and average weight gain by the nestlings at a *G. cachinnans* nest.

side of the wing bases. The body is flesh coloured and eyes are closed. The abdomen is the largest part of the body and viscera are visible through the skin. The gape is wide and yellowish in colour. In a few hours time bluish spots become distinct along the feather tracts. The average weight of eight nestlings at birth was 4 g (s.d. 0.25, range 3.5-4.3 g). They are responsive to tapping on the nest rim.

Brooding: Brooding started on the day of hatching, and continued till the seventh day of life. Both sexes shared brooding, one of the pair spent nights in the nest till the nestlings' departure. The highest brooding was recorded on the first day, 58% (Fig. 4). Young nestling passerines are not able to regulate body temperature (Pettingill 1956) after hatching and so the rate of brooding

was higher in the first few days. On the seventh day there was no brooding after 1308 hrs. On the eighth day the parents brooded only for 45 minutes. The average sessions during the brooding period were 22 (range 11-34) and the mean time spent per session was 11 minutes (range 1-35 minutes).

Development of nestlings: Whenever I visited the nests the parent birds gave loud alarm calls. To avoid the danger of attracting predators morphological changes and growth were recorded for only one pair of nestlings, daily between 0800 and 1000 hrs.

There was no remarkable change for the first two days. On the third day a horizontal slit on the eye ball had widened. A prominent sheath emerged at the sternoabdominal tracts. Rectrices started growing. On the fourth day the nestlings were more responsive to vibra-

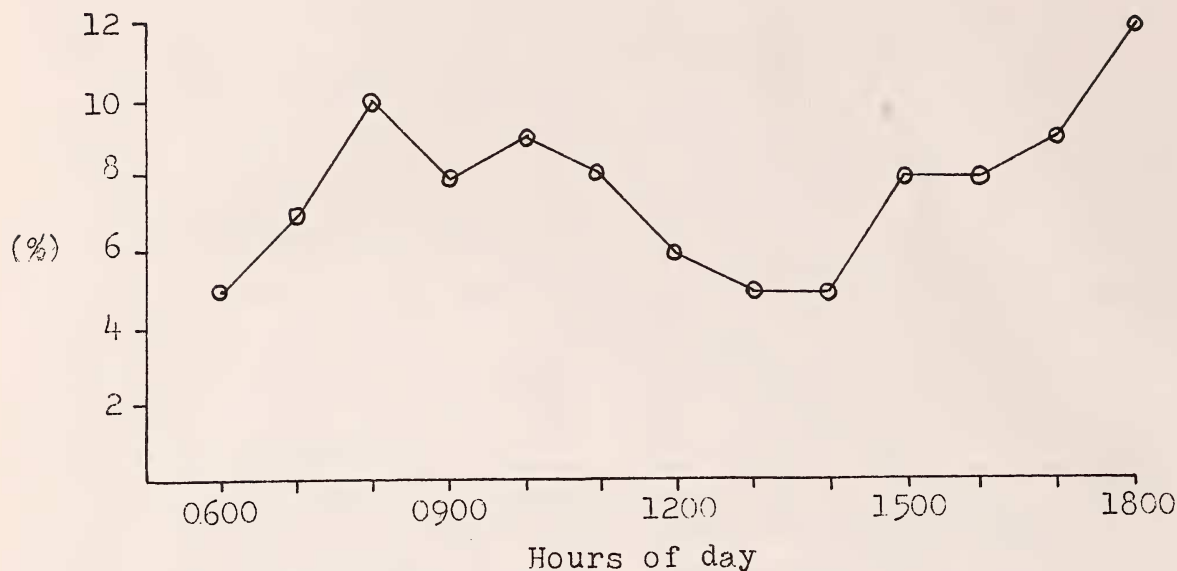


Fig. 6. Rate of visits for feeding the nestlings by the parents at a *G. cachinnans* nest at different hours of the day.

tions near the nest. All future feather tracts became conspicuous. On the sixth day the primary and secondary feathers were in pin, growing up to 10 mm and their coverts up to 4 mm. Rectrices 3 mm. On the seventh day the nestlings could open eyes partially. Bill 9 mm, wing 15 mm; primary and secondary feather calami 13 mm and 15 mm, their coverts 5 mm and 6 mm respectively. The nestlings started screaming while being weighed and the parents' alarm call was much louder. By the tenth day the nestlings could open their eyes fully. Bill and tarsus became darker and attained the average adult size of 16 mm and 30 mm respectively. They grasped the nest linings while being removed from the nest. On the fourteenth day the white eye stripe was prominent. Most of the feathers started sprouting having tufts of down at their tips. The nestlings preened and shook their bodies. On the seventeenth day the complete-

ly feathered nestlings more or less resembled the parents. Down was still attached to the tips of the feathers. Wing 20 mm, bill 16 mm, primary feathers c. 50 mm, secondary feathers c. 46 mm. The nestlings were jumping on the nest, fanning with the wings and crawling on the nest rim. On the eighteenth morning c. 0900 hrs both the nestlings left the nest by hopping from branch to branch. At that time the parents seemed to be agitated. They flew and hopped around restlessly close to the nestlings until the nestlings settled down in a well concealed place.

Nestling weight: The average weight of the nestlings (4.1 g) at hatching is more than two-thirds of the average weight of nestlings increased steadily from the first day to the thirteenth (Fig. 5) with average daily weight increases of 2.43 g (n=2). On the thirteenth day the average nestling weight was 35.7 g which is c. 75% of the average adult weight

(48.7 g, $n = 6$). There was a slight weight decrease of 0.3 g between the thirteenth day and the day before fledging. The feeding curve (Fig. 5) shows that there was no increase in the feeding rate from the thirteenth day of nest life.

Feeding rate: Both the parents fed the nestlings. Feeding behaviour was observed for c. 175 hours following the same methods as for incubation behaviour. The average number of feeding visits per hour was 4 (s.d. 1.9, range 2-7). The rate of feeding increased steadily from the first day (2%) to the thirteenth (8%). There was a fall (1%) in feeding rate on the fifteenth and sixteenth days.

There were two peaks of feeding during the day (Fig. 6), one at 0800 hrs (10%) and the other at 1800 hrs (12%). The feeding rate was high in the evenings perhaps to compensate for the non-feeding period of night. At daybreak the parents collected food for themselves as well as for the nestlings. This would explain the low feeding rate in the early morning.

The parents fed the nestlings with smaller insects for the first four days. From the fifth day onward bigger insects like caterpillars, grasshoppers and moths were brought. From the fifth to the seventeenth day caterpillars formed 40% of the total diet. *Rubus*, *Ilex* and other fruits were fed at the later stage of nestling period.

Nest sanitation: The parents swallowed all faecal sacs produced by the nestlings. While passing a faecal sac the nestlings elevated their cloacal regions, but sometimes the parents prodded to stimulate defecation. The excreta was enclosed in a whitish, oily sac. After delivering food, parents always waited for the faecal sacs, and c. 50% visits provide them with sacs.

Nestling period: The average nestling period was 16.5 days ($n = 11$, s.d. 0.87, range 15-18 days). It is reported by several workers that the nestlings of few birds leave the nest prematurely if handled during the last few days of nestling period. This did not happen with the pair of nestlings I weighed and handled regularly. But four other pairs of nestlings left while checking the nests. But I could not be sure whether they left prematurely or whether they were on the last day of their nest-life.

I had ringed two pairs of nestlings before they fledged. After leaving the nest, the fledglings remained hidden in foliage near the nests. They uttered acceptance call (*cre-re-re*) and constantly fluttered the wings while being fed by the parents. One pair remained with its parents for 21 days and the other for 29 days near the nest sites.

Loss of eggs and nestlings: Out of 62 nests, eggs from two nests were preyed upon by the crow pheasant *Centropus sinensis*. Other eggs ($n = 28$) and nestlings ($n = 11$) disappeared without trace and were probably robbed by crows *Corvus macrorhynchos* and *C. splendens* or snakes. Two eggs remained unhatched, one nestling was found dead in the nest.

Breeding success: Forty eight pairs of *G. cachinnans* were observed. Out of 106 eggs which were laid, 76 hatched and 64 nestlings fledged successfully (Table 1). The breeding success for 1983 and 1984 was 64% and 56% respectively ($x=60\%$) and the variation was not significant ($X^2 = 0.53$, d.f. 1, $p \leq 0.05$). This figure is slightly more than Lack's (1954) average figures of 45% for passerine birds with open nests, the range 22 to 59 per cent.

ACKNOWLEDGEMENTS

I am grateful to the late Dr Salim Ali for guiding this work. Mr J.C. Daniel, Dr Ali Reza Khan, Dr Robert B. Grubb, Mr S. A. Hussain and Dr R. Sugathan

helped me in various ways during the present study. The study was supported by a fellowship grant from the Salim Ali-Loke Wan Tho Ornithological Research Fund of the Bombay Natural History Society.

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